UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/998,684	11/30/2001	Leo Medeiros	60130-1280/00MRA0088	7366

26096 7590 09/14/2004

CARLSON, GASKEY & OLDS, P.C.
400 WEST MAPLE ROAD
SUITE 350
BIRMINGHAM, MI 48009

EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 09/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/998,684	MEDEIROS ET AL.
	Examiner	**Art Unit**
	Harry D Wilkins, III	1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 July 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-23 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 30 November 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-5, 8-13, 16, 18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izawa et al (US 5,665,179) in view of Keil et al (US 6,024,893)

Izawa et al teach the invention substantially as claimed. Izawa et al teach (see abstract) a method of making a steel coil spring that includes gas nitriding. The method inherently includes a step of determining a type of steel used in the steel coil spring.

However, Izawa et al do not teach selecting a nitriding potential based on the type of steel and regulating a nitriding potential in the nitriding atmosphere to control the step of nitriding.

Keil et al teach (see abstract) a method of controlling the nitriding potential during nitriding. The method produces high quality nitrided parts. The method inherently includes selecting a nitriding potential based on the type of steel used.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the nitriding potential controlling method of Keil et al in the method of Izawa et al because the controlling method produces high quality nitrided parts.

Regarding claim 2, the method of Keil et al monitors (see abstract) the oxygen content of the furnace atmosphere by means of an oxygen probe, and this process parameter is used to regulate the nitriding atmosphere.

Regarding claim 3, Izawa et al teach (see col 4, lines 10-24) that the nitriding includes treatment by ammonia. The amount of ammonia directly affects the nitriding potential of the atmosphere.

Regarding claim 4, Izawa et al teach (see abstract and col 4, lines 4-24) that the method includes grinding of the surface, and heating to 420-550°C to perform the nitriding. The process of Izawa et al does not expressly disclose a cooling step, but in order to use the nitrided spring, it would have to be cooled to ambient temperature from the nitriding temperature. The grinding of the surface disclosed by Izawa et al cleans the surface by removing any oxide scale present.

Regarding claim 5, Izawa et al teach nitriding at 420-550°C.

Regarding claim 8, Izawa et al teach (see abstract) further subjecting the steel spring to shot peening.

Regarding claim 9, Izawa et al teach (see col 4, lines 25-48) two separate steps of shot peening, one with 0.6-1.0 mm shot and one with 0.15-0.3 mm shot. It would have been obvious to one of ordinary skill in the art to have optimized the size of the shot to be 0.8 mm and 0.3 mm diameter, respectively, in order to maximize the formed compressive residual stresses.

Regarding claim 10, Izawa et al teach a method of making a steel spring including (1) cleaning the surface by grinding, (2) heating the spring to a nitriding

temperature, (3) inherently determining a type of steel to be used, (4) inherently selecting a nitriding potential based upon the chosen steel, (7) cooling the spring to ambient and (8) shot peening the spring. Izawa et al does not teach the steps of regulating a nitriding potential, nor controlling the regulating step with a computer. However, it would have been obvious to one of ordinary skill in the art to have used the nitriding potential controlling method of Keil et al in the method of Izawa et al because the controlling method produces high quality nitrided parts. Keil et al teach (see col. 3, lines 6-13) that the controller 110 controls the flow of the gases to adjust the flow of ammonia gas to the nitriding furnace. This controller is a computer.

Regarding claim 11, Izawa et al in view of Keil et al teach (as above) a steel coil spring that has a surface and a diffusion zone produced by nitriding the surface by regulation of a nitriding potential. The method of Keil et al inherently includes regulation of a nitriding potential having a value corresponding to a type of steel in the coil spring.

Regarding claim 12, Izawa et al teach (see col 4, lines 10-24) that the nitriding includes treatment by ammonia. The amount of ammonia directly affects the nitriding potential of the atmosphere.

Regarding claim 13, Izawa et al teach nitriding at 420-550°C.

Regarding claim 16, Keil et al teach (see col. 3, lines 6-13) that the controller 110 controls the flow of the gases to adjust the flow of ammonia gas to the nitriding furnace. This controller is a computer.

Regarding claims 18 and 21, though Keil et al do not disclose the duration of the nitriding and Izawa et al teach a nitriding time of 24 hours, it would have been within the

expected skill of a routineer in the art to have optimized the duration of the nitriding in order to optimize the thickness of the nitrided layer.

3. Claims 1, 3-16, 18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izawa et al (US 5,665,179) in view of Applicant's admission of prior art and "Modern Surface Treatments".

Izawa et al teach the invention substantially as claimed. Izawa et al teach (see abstract) a method of making a steel coil spring that includes gas nitriding. The method inherently includes a step of determining a type of steel used in the steel coil spring.

However, Izawa et al do not teach selecting a nitriding potential based on the type of steel and regulating a nitriding potential in the nitriding atmosphere to control the step of nitriding.

Applicant admits as prior art (see page 1, paragraph 6) that one known process is the Nitreg® process.

"Modern Surface Treatments" describes the Nitreg® process. The Nitreg® process involves nitriding of a workpiece while controlling the nitriding potential. The Nitreg® process delivers excellent and consistent results.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the Nitreg® method in the method of Izawa et al because the Nitreg® method produces high quality nitrided parts consistently.

Regarding claim 3, Izawa et al teach (see col 4, lines 10-24) that the nitriding includes treatment by ammonia. The amount of ammonia directly affects the nitriding potential of the atmosphere.

Regarding claim 4, Izawa et al teach (see abstract and col 4, lines 4-24) that the method includes grinding of the surface, and heating to 420-550°C to perform the nitriding. The process of Izawa et al does not expressly disclose a cooling step, but in order to use the nitrided spring, it would have to be cooled to ambient temperature from the nitriding temperature. The grinding of the surface disclosed by Izawa et al cleans the surface by removing any oxide scale present.

Regarding claim 5, Izawa et al teach nitriding at 420-550°C.

Regarding claims 6 and 7, "Modern Surface Treatments" teaches (see page 2, paragraph 8 and figure 1) that the Nitreg® process can produce any combinations of W/L (white layer-i.e.-the compound layer) diffusion. In figure 1, examples include a 55 μm diffusion zone with a 0 μm white layer. In fact, "Modern Surface Treatments" teaches that the process was able to optimize the thickness of both the diffusion layer and the white layer to any desired values.

Regarding claim 8, Izawa et al teach (see abstract) further subjecting the steel spring to shot peening.

Regarding claim 9, Izawa et al teach (see col 4, lines 25-48) two separate steps of shot peening, one with 0.6-1.0 mm shot and one with 0.15-0.3 mm shot. It would have been obvious to one of ordinary skill in the art to have optimized the size of the shot to be 0.8 mm and 0.3 mm diameter, respectively, in order to maximize the formed compressive residual stresses.

Regarding claim 10, Izawa et al teach a method of making a steel spring including (1) cleaning the surface by grinding, (2) heating the spring to a nitriding

temperature, (3) inherently determining a type of steel to be used, (4) inherently selecting a nitriding potential based upon the chosen steel, (7) cooling the spring to ambient and (8) shot peening the spring. Izawa et al does not teach the steps of regulating a nitriding potential, nor controlling the regulating step with a computer. However, it would have been obvious to one of ordinary skill in the art to have used the Nitreg® method in the method of Izawa et al because the Nitreg® method produces high quality nitrided parts consistently. Though "Modern Surface Treatments" does not expressly disclose that the regulating step is controlled by a computer, the Nitreg® process was known to utilize a computer for the regulating step. (For support, see "Today's Processing Options for Nitriding" at page 3, specifically the word "calculated".)

Regarding claim 11, Izawa et al in view of Applicant's admission and "Modern Surface Treatments" teach (as above) a steel coil spring that has a surface and a diffusion zone produced by nitriding the surface by regulation of a nitriding potential. The Nitreg® method inherently includes regulation of a nitriding potential having a value corresponding to a type of steel in the coil spring.

Regarding claim 12, Izawa et al teach (see col 4, lines 10-24) that the nitriding includes treatment by ammonia. The amount of ammonia directly affects the nitriding potential of the atmosphere.

Regarding claim 13, Izawa et al teach nitriding at 420-550°C.

Regarding claims 14 and 15, "Modern Surface Treatments" teaches (see page 2, paragraph 8 and figure 1) that the Nitreg® process can produce any combinations of

W/L (white layer-i.e.-the compound layer) diffusion. In figure 1, examples include a 55 μm diffusion zone with a 0 μm white layer.

Regarding claim 16, though "Modern Surface Treatments" does not expressly disclose that the regulating step is controlled by a computer, the Nitreg® process was known to utilize a computer for the regulating step. (For support, see "Today's Processing Options for Nitriding" at page 3, specifically the word "calculated".)

Regarding claims 18 and 21, though "Modern Surface Treatments" does not disclose the duration of the nitriding and Izawa et al teach a nitriding time of 24 hours, it would have been within the expected skill of a routineer in the art to have optimized the duration of the nitriding in order to optimize the thickness of the nitrided layer.

4. Claims 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izawa et al in view of Keil et al or Applicant's admission of prior art and "Modern Surface Treatments" as applied to claims 1 and 10 above, and further in view of Hakansson (US 5,108,544) and Dobo (US 4,023,989).

The teachings of Izawa et al, Keil et al, Applicant's admission of prior art and "Modern Surface Treatments" are described above in paragraphs nos. 3 and 4.

However, Izawa et al teach that the steel is cleaned by a grinding method, not by exposure to hydrochloric acid as claimed.

Hakansson teaches (see col. 1, lines 17-21) that the removal of an oxide scale from steel is known to be performed by many methods, including grinding and pickling.

Dobo teaches (see col. 2, lines 55-58) that hydrochloric acid pickling of steel to remove an oxide scale was well known.

Therefore, in view of the teachings of Hakansson and Dobo, the grinding method of Izawa et al is considered to be a functional equivalent of the hydrochloric acid pickling. Thus, it would have been obvious to one of ordinary skill in the art to have substituted the hydrochloric acid pickling of Dobo for the grinding method of Izawa et al because Hakansson teaches that the two are functional equivalents, i.e.-they both achieve the removal of an oxide scale from the surface of steel.

5. Claims 19, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izawa et al in view of Keil et al or Applicant's admission of prior art and "Modern Surface Treatments" as applied to claims 1, 10 and 11 above, and further in view of Sugimoto et al (US 5,009,843).

The teachings of Izawa et al, Keil et al, Applicant's admission of prior art and "Modern Surface Treatments" are described above in paragraphs nos. 3 and 4.

However, the composition of the steel spring of Izawa et al is silent as to the content of Al in the steel.

Sugimoto et al teach a spring steel composition in the same field of endeavor as the spring steel of Izawa et al. Sugimoto et al teach (see col. 3, line 40 to col. 4, line 4) that Al is added to the steel at 0.01-0.05 wt% for the purpose of forming fine nitride precipitates which add sag-resistance and durability to the spring.

Therefore, it would have been obvious to one of ordinary skill in the art to have added 0.01-0.05 wt% Al as taught by Sugimoto et al to the spring steel of Izawa et al because Sugimoto et al teach that the Al adds sag-resistance and durability to spring steels.

Response to Arguments

6. Applicant's arguments filed 28 July 2004 have been fully considered but they are not persuasive. Applicant has argued that the prior art does not teach selecting a nitriding potential based on the steel selected.

In response, while the prior art may not *expressly* disclose selecting a nitriding potential based on the steel composition selected, one of ordinary skill in the art was aware that the steel composition affected the ability of nitrogen to be absorbed. Thus, one of ordinary skill in the art would have found it obvious to select a nitriding potential based upon the steel composition chosen. Evidence supporting this conclusion can be seen in the last paragraph on page 390 of "Gas Nitriding". Basically, if a steel exhibits a smaller "case depth", then it resists nitrogen intrusion. In order to increase the amount of nitrogen absorbed and the speed at which it is absorbed, one of ordinary skill in the art would have increased the nitriding potential of the atmosphere, thus showing a selection of potential based on the steel to be treated. "Gas Nitriding" goes on to discuss (see pages 391-393) steels containing different alloying elements (aluminum, chromium) and indicates effects that these alloying elements have on the ability to be nitrided. Further in support of this position, please see pages 314-315 of "Gas Carburizing", especially the section on "Alloy Effects". This shows that the potential for an alloy to absorb C (and hence, similarly N in nitriding) is affected by the composition of the alloy, and as such, an alloy which resisted C or N intrusion would require a higher carburizing or nitriding potential. It is submitted that carburizing and nitriding are functional equivalents, at least in this instance, with respect to the carburizing and/or

nitriding potentials. Therefore, the Examiner maintains his position that one of ordinary skill in the art would have considered a step of selecting a nitriding potential based on the composition of the steel to be treated to inherently be present in the prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700